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End-stage renal disease prevention strategies in Latin America

BERNARDO RODRÍGUEZ-ITURBE and EZEQUIEL BELLORIN-FONT

Servicio de Nefrología, Hospital Universitario, Universidad del Zulia, Fundacite-Zulia, Maracaibo, Venezuela; and Hospital Universitario, Centro Nacional de Diálisis y Trasplante, Caracas, Venezuela

End-stage renal disease prevention strategies in Latin America. Latin America (LA), defined here as the countries in the Western hemisphere located south of the United States, is a region with a total population of nearly 520,000,000 that increases 1.5% annually and has a human development index of 0.77. The countries that form this region present extreme contrasts. These contrasts are first and foremost within the countries themselves, because extremes of wealth and poverty are present in their social and economic fabric. In addition, in LA a vast variety of government modalities and political systems are represented. Therefore, in order for prevention strategies to be effective, they need to be tailored to the specific characteristics and idiosyncrasies of individual nations. This article will address the following aspects: first, a broad outline of the basic health statistics in LA, with focus on treatment of end-stage renal disease and its derived economic burden. Data from LA countries will be contrasted with 95% confidence interval of corresponding data from 10 industrialized countries (Canada, France, Germany, Italy, Japan, United Kingdom, United States, Spain, Sweden, and Switzerland). Second, we will discuss the prevalence of some risk factors for end-stage renal disease in the nations of the region. For this reason, we will focus on data that provide reliable information. Finally, we will consider general guidelines for the implementation of prevention strategies that may have common applicability in LA countries.

WEALTH AND HEALTH IN LATIN AMERICA

Latin American (LA) countries have a mean gross domestic product (GDP)/capita of US $3.55, but the range extends from $12.79 (Argentina) to $2.40 (Cuba). Even the upper level is well below the 95% confidence interval (CI) of the chosen sample of industrialized countries (US $23.63-$29.17) [1]. The lack of uniformity in LA countries is manifested in the wide range of different wealth and health indicators. The proportion of individuals that live under the poverty line, represented by an income of less than US $1 per day, ranges from 55% (Guatemala) to 5% to 15% (Colombia, Venezuela, Mexico, and Chile) [2]. The proportion of the population without access to potable water ranges from 55% (Paraguay) to less than 5% (Uruguay) [3], and the proportion of the population without adequate sanitation ranges from 42% (Ecuador) to 5% to 6% (Chile, Costa Rica, Cuba, and Uruguay) [4].

Life expectancy at birth in LA is 70.5 years, but it ranges from 50 to 76.9 years, and expectation of a healthy life at birth ranges from 42.9 to 66.6 years. Life expectancy is correlated with gross national product (Fig. 1) [5].

LA countries have a mean of 153.4 physicians and 139 nurses per 100,000 inhabitants, but the range extends from 8.4 (Haiti) to 530 (Cuba) in the case of doctors, and from 10.7 to 677 in the case of nurses. The deficit is particularly evident in nurses, who are outnumbered by doctors 1.5 to 7 times in the majority of LA countries [6]. With the exception of Cuba and Jamaica, the sum of doctors and nurses is in deficit, with respect to the number in industrialized countries (Fig. 2). Therefore, it may be assumed that a shortage of doctors and nurses will dictate that their participation in prevention strategies will be limited. In specific countries and, particularly, in specific regions within a country with an overwhelming deficit of health personnel, planning of prevention strategies should probably include task-oriented training and, of course, adequate supervision of selected individuals in the community.

Relative expenditure in health in most LA countries is lower than in industrialized countries (Fig. 3A), ranging from 10.9% of the GDP in Uruguay to 2.4% in Ecuador [1]. More importantly, the actual expenditure in health in LA countries (mean = US $391 per capita per year; range, 78 to 1061) is 8 to 10 times lower than the corresponding figure in the developed world (Fig. 3B). It is obvious that the burden of optimal health care (for our purposes, defined as health care provided in the chosen sample of developed countries) cannot be met by LA nations, and deep inequalities in coverage and delivery are an inescapable reality that may only be mitigated with a concerted effort that includes reduction in the cost of essential drugs.

END-STAGE RENAL DISEASE IN LA

The Sociedad Latinoamericana de Nefrología e Hipertensión (SLANH) keeps a registry of end-stage renal disease (ESRD) and its treatment modalities in 20

Key words: risk factors, chronic renal failure, socioeconomic aspects, diabetes, hypertension.

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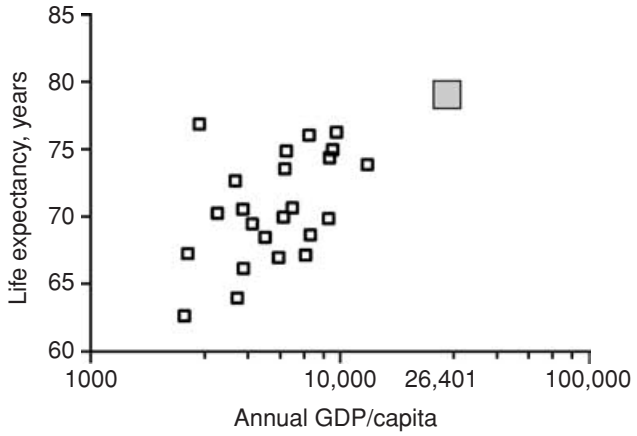

Fig. 1. Life expectancy is correlated with GDP per capita. Shaded square denotes the mean and 95% confidence interval of these values in the sample of industrialized countries chosen for comparison (see text).

Fig. 2. Mumber of medical doctors and nurses in LA compared with the corresponding number in industrialized countries. Dotted lines indicate the 95% confidence interval in industrialized countries; only 1 country (Jamaica) is within those limits. The rest of the countries are well below these limits, and 1 country (Cuba) has more health personnel than in the sample of industrialized countries.

nations of LA. The Dialysis Registry collects data from 14 of 20 countries and the Transplant Registry from 18 of 20 countries, and those data correspond with roughly 90% and 96% of the population in LA, respectively. According to the SLANH registry [7, 8], there has been a steady increase in all modalities of treatment from 192 patients per million (ppm) in 1992 to 349 ppm in 2001. The projection is that in 2005, there will be about 450 ppm (Fig. 4). In chronic dialysis, the registry from 2001 included a total of 277.1 ppm, of which 197 ppm were on hemodialysis and 80.1 ppm on peritoneal dialysis. There are countries with a relatively high prevalence of patients under treatment (>600 ppm: Puerto Rico and Uruguay), whereas the rest of the countries have an intermediate (300–600 ppm: Chile, Argentina, and Mexico), low (100–300 pmm: Brazil, Colombia, Cuba, Ecuador, Guatemala, Peru, and Venezuela), or very low prevalence (<100 ppm: Costa Rica and Paraguay). The SLANH has estimated that there is an unmet demand of 40 ppm and, consequently, 19 patients with ESRD do not receive treatment [7, 8]. As it is elsewhere in the world, in LA there has been a steady increase in the proportion of patients with diabetes and uncontrolled hypertension with ESRD; in LA, these etiologies represent at present 33% and 32%, respectively, of patients on chronic dialysis (Fig. 5).

It is evident that care of renal patients imposes increasing economic, human, and technical demands that have a greater impact in countries with lower GDP and health systems already overburdened with unsatisfied needs of primary care for the general population. As shown in Table 2, in the majority of countries, costs of chronic dialysis are largely covered by public funds (social security system and health budget), and participation of the private sector (health insurance companies) is very limited. The mean cost of hemodialysis in the 11 LA countries is US $11.55 ± 4.96 per patient per year, but it ranges from US $7.33 in Brazil to US $23.00 in Costa Rica. Dialyzer reuse has become an important cost-reducing strategy; countries in which dialyzer reuse is practiced in more than 90% of patients have 2 to 3 times lower costs than those in which reuse is not a common practice (Table 2). Nevertheless, care of the patient with ESRD cannot be covered adequately with budget allocations, and therefore, represents one of the more obvious examples of inequality of access and delivery of medical care in LA.

Nearly 60,000 patients have received renal transplantation in LA. In the last 2 to 3 years, the number of transplants in the region has remained steady at 5.4 to 5.6 renal transplants per year, roughly 55% of which are from living related donors, except in Argentina, Chile, Cuba, Uruguay, and Venezuela, where the proportion of cadaveric donors is 60% or higher [7, 8].

SOME RISK FACTORS IN LA

Hypertension

The prevalence of hypertension (systolic blood pressure ≥140 mm Hg, diastolic blood pressure ≥90 mm Hg) in some LA countries has been reviewed in a consensus conference [9]. The mean value of the prevalence of hypertension in LA is 27.8% (22% in Peru to 33% in Uruguay). However, as shown in Table 1, more than half of the patients with hypertension ignore that they have high blood pressure, 30% of these patients are actually treated (18.2% in Paraguay to 42% in Argentina and Uruguay), and only 18.7% are considered to be controlled (6.7% in Ecuador to 22% in Mexico). Because one third of ESRD is reported to be the result of uncontrolled hypertension in LA (Fig. 5), blood pressure evaluation and control are likely to have a major impact in the prevalence of ESRD in the region.

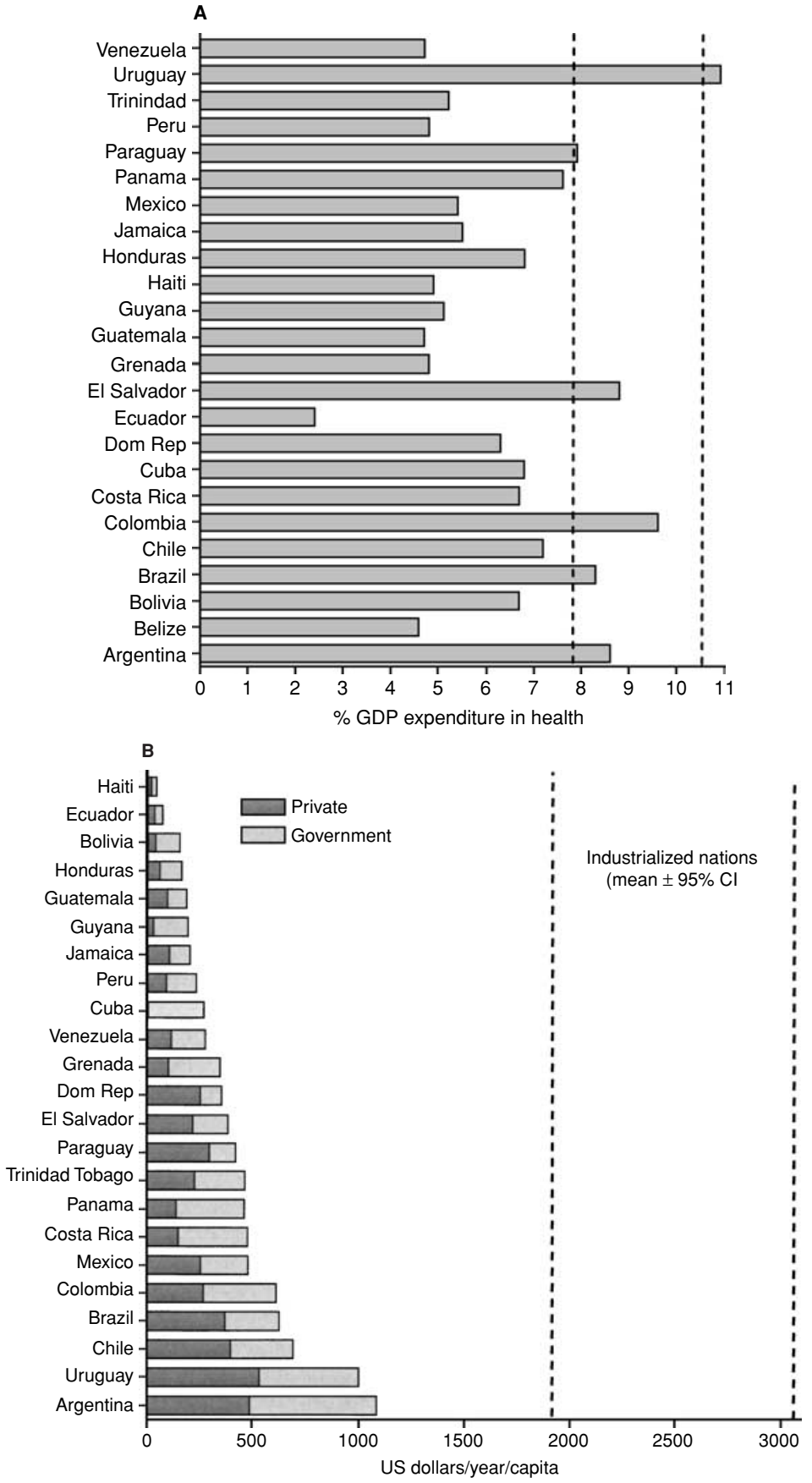

Fig. 3. The national expenditure in health is shown as a percentage of the GDP (*A*) and in US dollars per capita (*B*). Dotted lines represent the 95% confidence interval in industrialized countries.

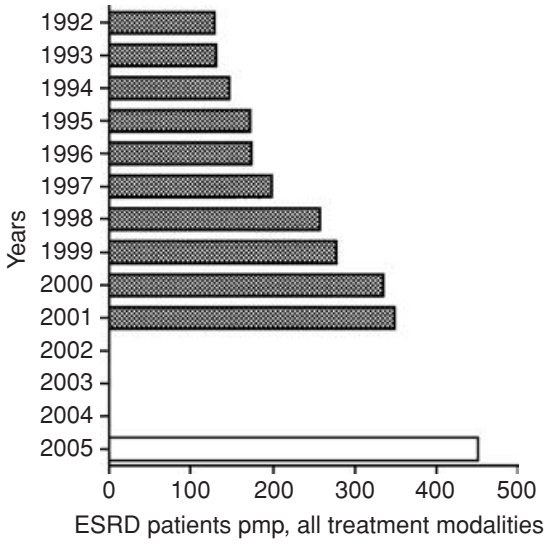

Fig. 4. Yearly increment of patients in all modalities of treatment for ESRD. In 2005, it is projected that LA will have 450 patients pmp on renal replacement therapies.

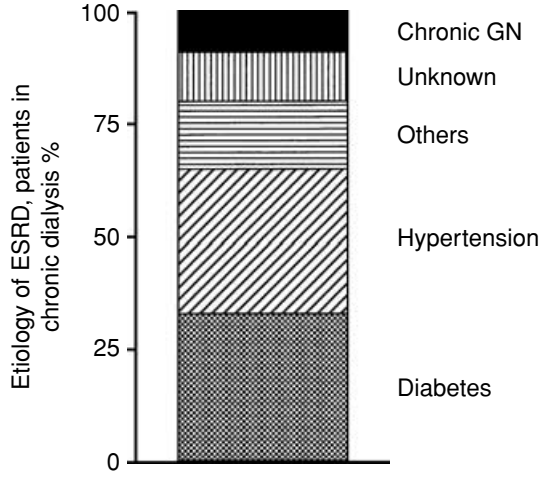

Fig. 5. Etiology of patients on chronic dialysis in LA. Hypertension (32%) and diabetic nephropathy (33%) make up two thirds of patients.

Low birth weight

Evidence is accumulating in favor of the postulate that low birth weight (<2500 g) may play a role in adult hypertension and chronic renal disease inasmuch as there is a correlation between reduced birth weight and nephron number [10]. Although in industrialized countries only 5.6% of newborns have low birth weight, in LA the proportion is 10% (Fig. 6), ranging from 5% in Chile and Paraguay to 15% in Haiti and Nicaragua [11]. Strategies to improve pregnancy control and maternal nutrition will likely have an impact in reducing this potential risk factor.

Table 1. Hypertension in selected Latin American countries

	Prevalence%	Known%	Treated%	Controlled%
Argentina	28.1	54	42	14.3
Brazil	26.8	50	30	10
Chile	22–8	43	26.1	8.2
Cuba[a]	30	75	NA	NA
Ecuador	28.7	41	23	6.7
Mexico[b]	30.5	28	38	22
Paraguay	30.5	33.5	18.3	7.8
Peru	22	40	20	10
Uruguay	33	68	42	11
Venezuela	32–4	47	37	8.5

NA, not available. Values taken from Consenso Latinoamericano sobre hipetensión arterial. *J Hypertens* (Edición en Español) 6:1–27, 2001.

[a]DE LA OSA JA: Hipertensión arterial. Available at://consulta.cuba.cu; SALAZAR J, AGUILAR J: Prevalencia de la hipertensión arterial en un consultorio médico de familia. Available at: www.bvs.sld.cu/revistas/san/vol2_4_98/san02498.htm

[b]VELAZQUEZ-MONROY O, ROSAS PERALTA M, LARA ESQUEDA A, *et al*: Prevalence and interrelations of non-communicable chronic diseases and cardiovascular risk factors in Mexico. Final outcomes from the National Health Survey 2000. *Arch Cardiol Mex* 73:62–77, 2003

Diabetes

Diabetes is an increasingly important risk factor in ESRD. It has been estimated that 19 million patients with diabetes exist in LA, and projections are that the number of patients with diabetes in 2025 will reach 64 million [12]. The direct cost of diabetes has been calculated to be US $703 per capita per year. If we assume that similar costs are applicable in LA countries, the value would represent twice the mean health expenditure per capita in the region (Fig. 7) [13].

OUTLINE OF STRATEGIES FOR PREVENTION OF ESRD IN LA

Prevention strategies need to involve government authorities, the medical community, and the general public. Only with the participation of all these separate compartments is there a reasonable chance of success in any prevention strategy. The cooperation of health administration, health personnel, and public opinion is best assured enlisting the effort of local societies of nephrology. The leadership of national societies of nephrology is pivotal to the implementation of any prevention strategy because in these societies there are generally medical and academic resources with open lines of communication to administrative government levels. In addition, medical societies have the capacity to reach out to the general public to increase awareness and develop currents of opinion. The International Society of Nephrology (ISN), through the Commission for the Global Advancement of Nephrology (COMGAN), has already established a working relationship with almost every one of the national societies of nephrology in LA, as well as with SLANH. The following strategies are recommended:

ISN-COMGAN has been supporting conferences and symposia dedicated to prevention that are organized by

Table 2. Costs of hemodialysis in Latin American countries

Country	Cost/session *US* $	Cost patient/ year *US* $	Dialyzer reuse *% patients*	Source of coverage%		
				Gov	SS	Private
Argentina	65	9360	100	7	86	7
Bolivia	80	9600	100			
Brazil	47	7332	95	95		5
Colombia	90	14,040	0	40		60
Costa Rica	150	23,000	0		100	
Chile	54	8510	95	95		5
Ecuador	60	9000	100			
Mexico	89	12,876	0		95	
Peru	44	6864	90		99	1
Uruguay	57	8892	95	100[a]		
Venezuela	112	17,550	0	10	90[b]	
Mean ± SD	77 ± 32	11,547 ± 4962				

Abbreviations are: Gov, health budget of the government; SS, social security. Costs include supplies and services. Costs were obtained by personal communication with nephrologists in individual countries.

[a]National resource fund.

[b]Social security funds include government and workers.

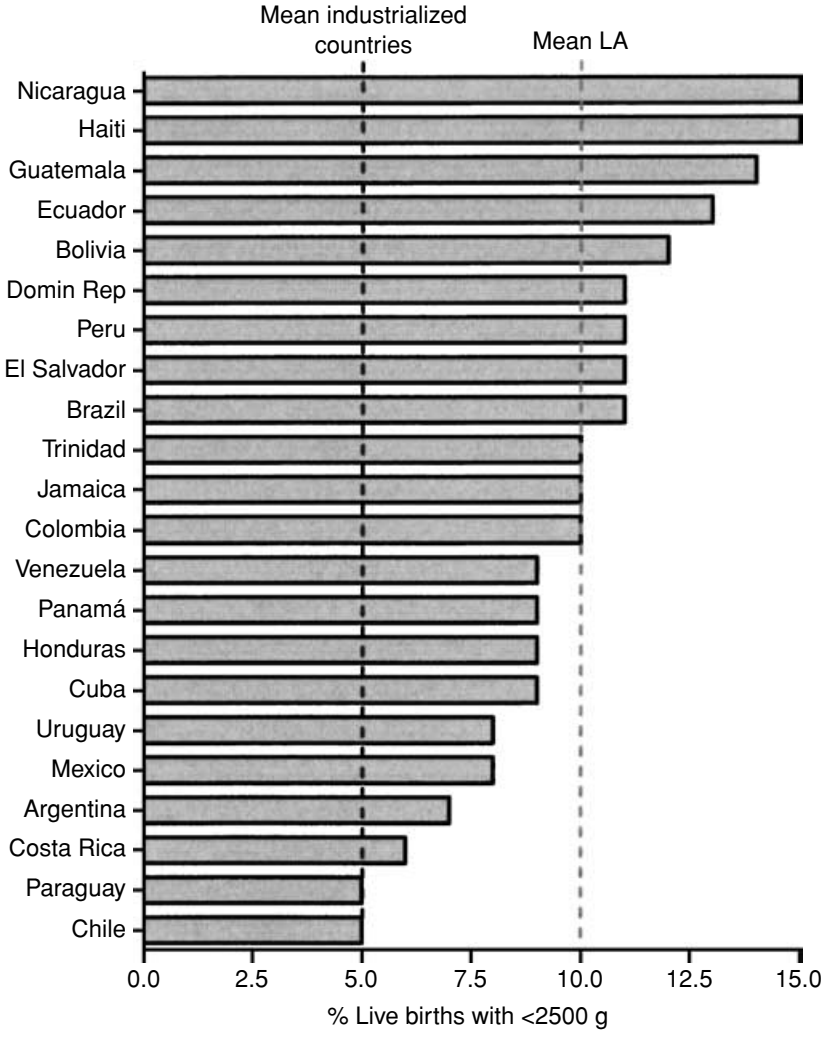

Fig. 6. Low birth weight in LA. The mean incidence of live births of less than 2500 g is 2 times higher than that in industrialized countries.

nephrologic societies in each individual country. In these activities, there is joint participation of ISN-COMGAN speakers and local specialists. As a rule, these meetings are widely praised and have a strong local participation. These activities need to be continued and strengthened.

The prevalence of some risk factors for ESRD, for instance proteinuria and microalbuminuria, are unknown

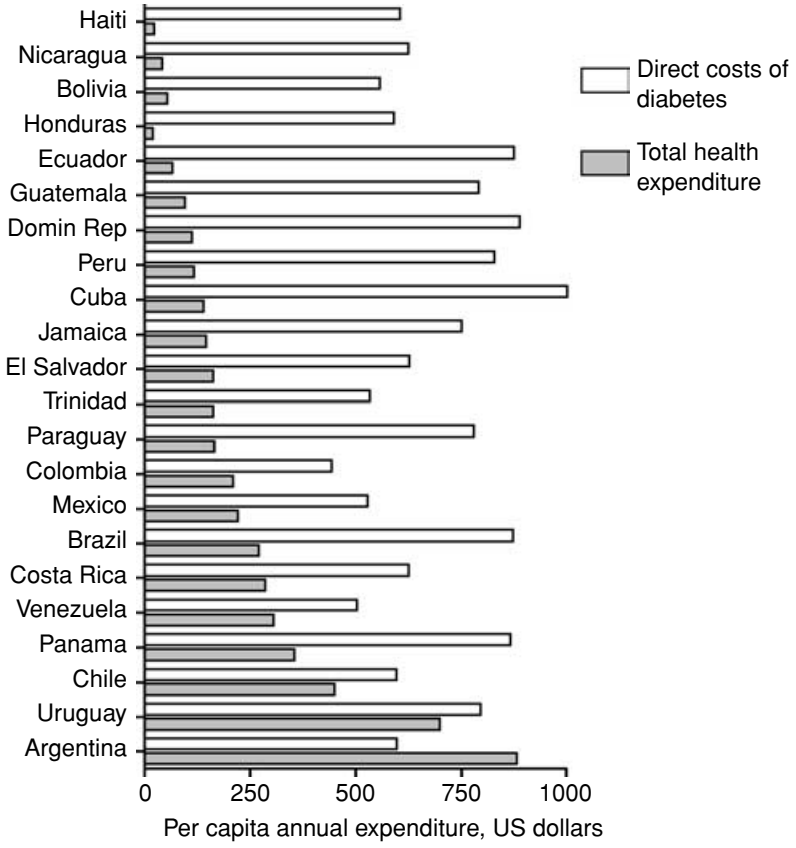

Fig. 7. Total per capita expenditure in health in LA is contrasted with calculated direct costs estimated to be caused by diabetes.

or only partially known, in most regions of LA. Epidemiologic studies in representative populations need to be encouraged and supported. Help may be required in the design and evaluation of epidemiologic studies, because only 48% of the studies to estimate the prevalence of hypertension in LA published between 1966 and 2000 met a critical threshold to be useful for surveillance purposes [14].

The participation of national health authorities may be encouraged by promoting high-level governmental programs, such as "The sustainable and tenable renal health model: A Latin American proposal of classification, programming and evaluation" designed by Rafael Burgos and Santos Delpine [15]. This program aims to integrate a renal health model into national public health policies, and has already been approved in Chile and is presently been applied in Valdivia.

Access of information to nephrology practitioners may be accomplished through periodicals or by the Internet. Full-text access to nephrology journals is important to support academic nephrology. Although Internet users still represent a relatively low percentage of the LA population, ranging from <1% (Cuba) to 20% (Chile), their numbers have risen dramatically in all LA nations (with the exception of Cuba) to 45 to 50 million users in 2005 [16]. More than 90% of the users are professionals, and 8 to 9 of every 10 individuals in academic positions have Internet access in the most populated countries in LA [17]. Academic nephrology is probably the core of most potential prevention strategies. The strength of academic nephrology in LA is limited by the lack of free access to full-text articles, because budget limitations have reduced and/or eliminated medical library subscriptions, and the cost of 5 widely read nephrologic journals (*American Journal of Kidney Diseases*, *American Journal of Physiology Renal Physiology*, *Journal of the American Society of Nephrology*, *Kidney International*, *Nephrology Dialysis Transplantation*) is equivalent to 1 month (Brazil) to 4 months' (Paraguay) salary of a full-time associate professor in LA countries.

Last, but by no means least, is the cost of medication in any prevention program. The vast majority of the population in LA countries cannot afford the cost of medications that are currently known to slow progression of renal failure. Therefore, the burden of purchasing and delivering these medications to individuals at risk must be taken by LA governments that need to be convinced of the economic benefit of prevention strategies and offer the drugs at an affordable cost.

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Reprint requests to Bernardo Rodríguez-Iturbe, Apartado Postal 1430, Maracaibo 4001-A, Estado Zulia, Venezuela.
E-mail: bernardori@telcel.net.ve

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